



Cereal Systems Initiative for South Asia in Nepal (CSISA-NP)

Agronomy & Seed Systems Scaling

Annual Report October 2017

Submitted to:

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Period covered: October 1, 2016 to September 30, 2017



Funded by **BILL & MELINDA
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Table of Contents

Acronyms and Abbreviations	3
Program Overview	4
Executive Summary	5
Progress Against the Work Plan	
Objective 1: Seed Systems	8
Objective 2: Lentil and Mungbean	11
Objective 3: Wheat	13
Objective 4: Fertilizer Productivity	16
Additional Information	
Key challenges during the reporting period	19
Engagement with Missions, FTF partners and project sub-contractors	19
Appendix 1: Staffing	21
Appendix 2: Project sub-contractors and key partners	22
Appendix 3: CSISA-Nepal Scaling and the GFSA	26
Appendix 4: Indicators	28

Acronyms and Abbreviations

Acronym	Full Name
CIMMYT	International Maize and Wheat Improvement Center
CSISA-NP	Cereal Systems Initiative for South Asia in Nepal
DADO	District Agricultural Development Office
DoA	Department of Agriculture
FtF	Feed the Future
GoN	Government of Nepal
ha	Hectare
HH	Household
kg	Kilogram
KISAN	Knowledge-intensive Sustainable Agriculture and Nutrition project
NARC	Nepal Agricultural Research Council
NAMEA	Nepal Agriculture Machinery Entrepreneurs Association
NGLRP	National Grain Legumes Research Program
NSAF	Nepal Seed and Fertilizer project
NWRP	National Wheat Research Program
PMAMP	Prime Minister's Agriculture Modernization Project
SEAN	Seed Entrepreneurs Association of Nepal
SQCC	Seed Quality Control Center
USAID	United States Agency for International Development
ZT	Zero tillage

Program Overview

Cereal and pulse yields in Nepal fall well below regional averages and present rates of increase won't meet long-term domestic requirements. Factors that contribute to low staple crop performance in Nepal include scarce farm labor, poor knowledge of best agricultural management practices, insufficient irrigation and mechanization, and farmers' inability to take risks and invest in new technologies. Also, innovative applied research has long been under-funded and research benefits have rarely reached farmers. Nepal's Mid and Far West development regions are most acutely affected by these constraints as these regions have the highest poverty and receive the lowest investment by the private sector. As a result, the Cereal Systems Initiative for South Asia (CSISA) works in Nepal's Terai plains and mid-hills where the scope for improving farmers' lives through agriculture is greatest.

The Government of Nepal's (GoN) 20-year Agriculture Development Strategy (ADS)¹ recognizes the need for new science-led innovations, crop diversification options for income generation, strengthened input systems for seed and fertilizer, mechanization to cope with outmigration and an aging agricultural workforce, and enterprise development to create new jobs and extend essential support services to large numbers of farmers. In support of these priorities, CSISA works with partners who can help to rapidly and broadly increase the adoption of sustainable intensification technologies at scale. CSISA's partners include Feed the Future's KISAN project, government agencies, farmers' groups, service providers, agro-dealers, seed enterprises and other private sector companies.

CSISA's 'Scaling Seed and Sustainable Intensification Technologies in Nepal' project pursues the following objectives:

1. Pulse (lentil and mungbean) intensification and diversification, adopted at scale
2. Cropping system-based approaches for sustainably intensifying wheat and minimizing terminal heat stress, adopted at scale
3. Facilitation of efficient and low-risk strategies for the precise and productive use of nutrients
4. Robust seed systems that ensure timely access to elite cultivars and hybrids
5. Scale-appropriate mechanization and irrigation (This year, this topic has been addressed in a separate report and provided as an 'end of project' report to USAID India.)

These activities are part of a four-year program funded jointly by USAID Washington and USAID India. USAID Washington has provided \$3,000,000 over four years to support wheat, lentil and mungbean agronomy; the efficient use of fertilizers; and seed system scaling. USAID India provided \$1,000,000 over the first two years to support CSISA's work in mechanization and irrigation, focusing specifically on increasing the ways in which Indian agricultural technologies can support efficient and climate-resilient agriculture in Nepal. The USAID Washington program runs from October 2014 to September 2018.

¹[Agriculture Development Strategy \(ADS\), 2014](#)

AGRONOMY & SEED SYSTEMS SCALING

Theory of Change and Approach

The yields of cereal crops and pulses in Nepal are well below regional averages, and present rates of increase are insufficient to meet near or long-term domestic requirements. Factors contributing to this underperformance include tightening labor markets, poor knowledge of modern best management practices, insufficient availability of irrigation water and mechanization, and low appetites for risk and capacity for investment among asset-poor farmers. CSISA-Nepal Agronomy and Seed Systems Scaling aims to address these constraints by (1) strengthening seed systems so farmers have timely access to improved varieties and hybrids for pulses, wheat and maize; (2) targeting geographic niches and identifying management practices that enable cropping system intensification through the cultivation of lentil and mungbean; (3) recommending best management practices for wheat, including scale-appropriate mechanization technologies that help farmers plant early and avoid terminal heat; (4) facilitating market development for small-scale technologies that enable precise nutrient management; and (5) supporting the expansion of the private sector for sustainable intensification technologies into the Mid and Far West, including the availability of 'spares and repairs,' and expanding the number of service providers so that farmers in rural areas can gain affordable access to new technologies.

FY17 Indictors of Progress (see Appendix 3)

In FY17, CSISA's Agronomy of Seed Systems Scaling project met its targets for all Feed the Future indictors, achieving impact with 32,267 farmers on 14,367 hectares. The project provided support to 770 informal and formal firms and training to 535 individuals. Success has been propelled by collaborations such as our engagement with the Prime Minister's Agriculture Modernization Project, capacity building exercises with seed companies and input suppliers, and with sustainable intensification technologies and management practices like seed drills, mechanical spreaders, reapers, and timely sowing of wheat and maize.

Major Activities and Accomplishments

STRENGTHENED SEED SYSTEMS

- CSISA's on-farm research in the mid-hills of Nepal conclusively demonstrates that the simple step of planting maize hybrids instead of open-pollinated varieties can increase grain yields by 50% with no other changes in management. Despite these advantages, before 2015 no hybrids were registered for cultivation in the Feed the Future zone and very few farmers were growing them. After helping the National Maize Research Program formally register four adapted hybrids for cultivation in the Feed the Future zone, CSISA has intensively worked with private sector partners to bring these hybrids to market while building awareness among famers of the benefits of cultivating hybrids. Because of these efforts, **NIMBUS supplied 100 tons of seed – enough to plant approximately 5,000 hectares – across the Feed the Future Zone** in 2017.
- Seed sales by our most growth-oriented seed company partners have increased by more than 90% since the inception of CSISA-Scaling, with an expansion of 1,032 tons from 2016 to 2017. Approximately half of the increase in sales is for wheat, suggesting a **year-on-year increase of 4,300 hectares planted to newer wheat varieties with quality seed**.
- Out-crossing and genetic drift are major impediments to seed sector commercialization, and seed companies supported by CSISA have started

maintenance breeding to improve the quality of source seed while new elite varieties, including Pant Mung 5 in mungbean and BL 4341 in wheat, are being registered with the government.

SUSTAINABLE LENTIL AND MUNGBEAN INTENSIFICATION AT SCALE

Lentil

- Even though lentil remains a priority value chain for Feed the Future in Nepal, the apparent increasing occurrence of winter rains has made lentil production an uncertain and unprofitable enterprise due to severe fungal disease pressure. To facilitate a common approach among research and extension partners towards adoption of sensible management practices to cope with these threats, CSISA convened experts from the National Grain Legume Research Program, Plant Protection Directorate of Department of Agriculture, and private partners to **consolidate the validated knowledge and experience in managing *Stemphylium* disease for lentil**. Consensus management recommendations endorsed by convening partners were disseminated through FM radio spots and the distribution of disease management tips through District Agriculture Development Offices (DADOs), the USAID-funded KISAN project, and the network of agricultural retailers in the Feed the Future Zone.

Mungbean

- CSISA's efforts to promote mungbean through market facilitation, technical advice, and public-private partnerships helped increase mungbean production significantly. In 2017, **more than 1,500 farmers were newly engaged with mungbean** grain production and in aggregate **produced more than 600 tons of grain with a market value of US\$ 540,000**.
- Increasing mungbean cultivation has the potential to improve **nutritional outcomes**, particularly for women and children who are disproportionately protein deficient. Survey data from 2016 show that almost all farmers who are new cultivators of mungbean keep a portion of the crop, retaining an average of 36% of the protein rich pulse for household consumption.

SUSTAINABLE WHEAT INTENSIFICATION AT SCALE

- To address knowledge gaps, key messages have been communicated through under-utilized communication channels including printed tips and radio jingles. As a result of these efforts, survey results estimate that **5,300 farmers adopted timely wheat seeding on 3,700 ha** in the Feed the Future districts in 2017, thereby increasing resilience to terminal heat stress and preserving yield potential. To better cope with the lower winter rainfall, approximately **5,000 additional farmers applied supplemental irrigation** based on agro-advisories provided by CSISA.
- CSISA continued to facilitate the adoption of zero till wheat at scale through training and market facilitation. With this effort, more than **150 service providers purchasing seed drills from a base near zero in 2015** – establishing a critical mass of machinery while establishing value chains to drive future sales.

In collaboration with the Prime Minister's Agriculture Modernization Project, CSISA organized the first **'wheat forum' to unite and coordinate efforts among core public and private stakeholders working on extension, research and sector development**. The forum emphasized the identification of proven best practices for sustainable intensification, consideration of scaling pathways for

knowledge and technological innovations, knowledge gaps for future research, and joint work plan development for the 2017–18 wheat season.

PRECISION NUTRIENT MANAGEMENT

- To characterize fertilizer responses with respect to seeding time, variety and irrigation levels across major soil gradients, CSISA conducted on-farm and on-station research in coordination with the new USAID-Nepal funded Nepal Seed and Fertilizer (NSAF, US\$ 15 m from 2016–21) project, an initiative with a focus that spans the applied science-to-development continuum, inclusive of market facilitation efforts to expand private sector-led fertilizer sales. **NSAF was designed by CSISA staff during 2016 to capitalize on the evidence, insights, and momentum created by CSISA programming in Nepal and is intended to catalyze the adoption of precision nutrient management practices by more than 50,000 households.** This is a prime example of the leverage created by CSISA through other programming and is fully aligned with USAID-Nepal’s priorities for the Feed the Future Zone.
- To provide a low-cost pathway for increasing management precision, CSISA facilitated the uptake of the mechanical spreader through training and market facilitation. On-farm research shows that the use of the spreader for urea top-dressing improves cereal yields in Nepal by 7–10% while saving 50% in labor costs. Three major importers have already sold more **than 1,500 precision spreaders and have placed a new order for > 500 additional units.**

OBJECTIVE 1: STRENGTHENED SEED SYSTEMS

Enabling Nepali farmers to adopt improved crop varieties is considered fundamental to raising productivity and developing greater resilience to biotic and abiotic stresses. This is because rain fed subsistence farming is common and seed replacement rates of major cereal crops is quite low (around 11%). The national seed industry is at a nascent stage and most of the crop varieties are obsolete, and farmers are also not aware of the economic benefits of varietal replacement. CSISA is working to develop robust seed systems for cereals and legumes by enhancing the technical and business management capacities of seed enterprises to make them technically stronger, market-oriented, professionally organized, and strategically linked with various actors along the value chain.

To address the aforementioned challenges and opportunities, CSISA adopted a public–private partnership approach to strengthen the capacity of stakeholders involved in wheat, maize and pulse (i.e., lentil and mungbean) value chains. These stakeholders include seed companies, dealers, producer groups, cooperatives, research and development organizations and development partners. CSISA is facilitating the partners to close knowledge gaps about the yield performance of lentil and mungbean, wheat cultivars and registered maize hybrids, through networks of community-based evaluations that provide crucial science-led insights and generate demand for seed companies, dealers, and among farmer-clients for these businesses. For mungbean, evaluations have been co-sponsored by seed companies, the Department of Agriculture, and the Nepal Agricultural Research Council.

During the reporting period, **business mentoring was provided to 15 private seed enterprises and 150 seed producer groups and cooperatives. An estimated total of 16,224 households planted improved seeds of cereals (wheat, maize and rice) and legumes (mungbean and lentil), covering 8,018 ha.**

Input dealers stock and market registered maize hybrids

Despite the yield and profitability advantages achievable with hybrids (>50%), very few farmers in the mid-hills cultivate them in the Feed the Future (FtF) Zone. Also, until recently the government had not registered (i.e., ‘sanctioned’) hybrids for cultivation in the FtF Zone due primarily to an absence of field data to validate performance. After working with the National Maize Research Program (part of the National Agriculture Research Council) to register four promising hybrids in 2015, CSISA focused on market development efforts with private sector partners to increase awareness among farmers and seed availability through retailers.

During the reporting period, CSISA organized market development meetings between NIMBUS, which is an exclusive importer of Bioseed’s hybrid maize seed into Nepal, and seed dealer networks in Banke, Bardiya, Kailali and Dang districts. During the meetings, dealers expressed a desire to stock more hybrid seed in 2017 based on favorable farmer responses in 2016. As a result, **NIMBUS supplied 100 tons of hybrid seed in 2017— enough to plant approximately 5,000 hectares.**

Private seed companies expand businesses for wheat and pulses

Since 2014, CSISA has provided mentoring support to emerging Nepali seed companies for business planning, technical guidance and market development.

Company-led market development: To generate demand among farmers, four of the top performing and most proactive companies (GATE Nepal, Panchashakti, Unique and Lumbini), mentored by CSISA, conducted 120 demonstrations of newly released (Banganga, BL 971, Sworgadwari) and pipeline (Munal, Cyakhura, BL 4341) wheat varieties that have not yet been adopted at scale by Nepali farmers. The seed companies estimated that about **12,000 households visited these**

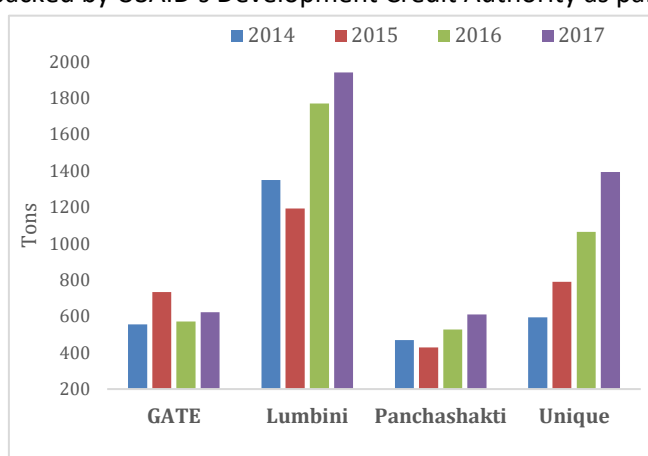
demonstrations during the growing season, and about 10 tons of seed was collected from the demonstration for next year's planting.

Technical advances: Following technical training, the aforementioned companies started maintenance breeding for wheat in 2016 to enhance the quality of source seed used for 'truthfully labeled' seed production. Building markets in regions like Nepal where farmers do not regularly purchase seed is a challenge. Maintenance breeding helps maintain seed quality and therefore develop trust among farmers that they are purchasing a reliable product, worth their investment.

The varieties undergoing maintenance breeding are recently released varieties, pipeline varieties, and a newly introduced variety called Borlaug 100. Borlaug 100 is from Mexico, introduced by CIMMYT in 2016 in coordination with the National Wheat Research Program in response to the emerging threat of wheat blast in South Asia. In addition to resilience traits, four of the newer wheat varieties prioritized for the Nepal market are comparatively rich in iron and zinc. Seed companies have produced and stocked 8 tons of source seed from their maintenance breeding operations.

Financing for growth: A core component of CSISA's mentoring efforts for companies has been the creation of business plans that are based on a vision for growth that is specific to each company. Having a convincing business plan is an important component of securing financing to drive expansion, and the companies supported by CSISA have tapped into loan programs funded by the International Fund for Agricultural Development and the Asian Development Bank. These sources of capital have allowed the 11 seed companies to expand their facilities to include seed storage buildings, processing plants and laboratories. CSISA is also working to facilitate commercial lending between the companies and banks that are backed by USAID's Development Credit Authority as part of the Nepal Seed and Fertilizer program that is also implemented by CIMMYT with support from USAID-Nepal.

Accelerating seed sales: The rapid growth of seed sold to farmers by our private sector partners is strong evidence that CSISA is significantly contributing to the emergence of strong, sustainable, and market-oriented seed systems in Nepal. Since the base year of 2014, prior to the inception of CSISA-Scaling, **aggregate seed sales by our partners have increased by more than 90%** with an additional 1,032



tons by our four most ambitious companies produced in 2017 (see inset).

Approximately **half of the increase in sales is for wheat, suggesting a year-on-year increase of 4,300 hectares planted to newer wheat varieties with quality seed in 2017.**

Encouraging signs of growth have also occurred in the market for mungbean. GATE Nepal sold about 10 tons of mungbean seed for the 2017 season, and through contract arrangements with farmer groups and cooperatives, expects to double this figure to 20 tons in 2018.

Strategic investments and enhanced coordination among seed system actors

Linkages to policy innovations and development programs: At the invitation of our government partners, CSISA participated the three key strategy meetings during the reporting period: 'Seed Vision Review,' 'Regional Seed Balance Sheet Development,' and 'Orientation for Zone and Super Zone Leaders under Prime Minister Agriculture Modernization Project (PMAMP)'. In these platforms, CSISA shared information about opportunities for scaling new wheat, maize and legume varieties, as well as information about inclusive business models for reaching relatively poor farmers.

Since the PMAMP is envisioned as a 10-year, US\$ 100 m investment, strategic coordination with this program is a top priority for CSISA. CSISA organized national-level wheat and maize thematic working group meeting in partnership with PMAMP, and detail action plans have been developed. This initiative has been useful not only in institutionalizing CSISA's innovations and findings but also in designing approaches that are market-oriented among our private sector partners.

CSISA also helped strengthen the Seed Entrepreneurs' Association of Nepal (SEAN) and National Seed Producer Association by updating their vision for government engagement and improving the types of services provided to members. Consequently, the associations jointly requested the government to withdraw existing seed subsidies that do not facilitate the development of markets for new varieties. In response, the Ministry of Agricultural Development formed a three-member committee comprising SEAN, Seed Quality Control Center (SQCC) and District Agriculture Development Offices to make recommendations for potential seed subsidy revisions. Encouragingly, the subsidy for NL 297, a 35-year-old wheat variety, was removed at the request of SEAN and SQCC.

Looking forward

A variety of key activities started through CSISA-Nepal Scaling's seed systems objective have a high potential for being carried forward by partners or other donor-funded projects, as evidenced by examples provided below.

- **Strategic government partnerships:** The Prime Minister's Agriculture Modernization Project focuses on the same core cereal crops that CSISA works on – wheat, maize and rice – and has the resources and the reach to support crop production at scale. CSISA has already collaborated with PMAMP to start thematic working groups for wheat and maize, and in partnership they have developed action plans for the 2017–18 winter cropping season. They are now starting to form a working group for rice, and will plan for the next rice cropping season. With continued technical backstopping and support on seasonal work plan development from CSISA, PMAMP can carry forward agronomic interventions for cereal cropping systems in CSISA's working domain.
- **Institutionalization of innovations:** National Wheat Research Program (NWRP) has developed and submitted a proposal for the release of wheat variety BL 4341 at National Seed Board. The data generated from 11 PVS trials through seed companies in the CSISA working districts was used for this purpose. Seed companies have also stocked 8 t of seed of this variety for planting next year. Upon the release of this variety from SQCC, it will be disseminated through the government's extension channels, and NWRP will take ownership for maintaining the source seed.

OBJECTIVE 2: SUSTAINABLE LENTIL AND MUNGBEAN INTENSIFICATION AT SCALE

Lentil

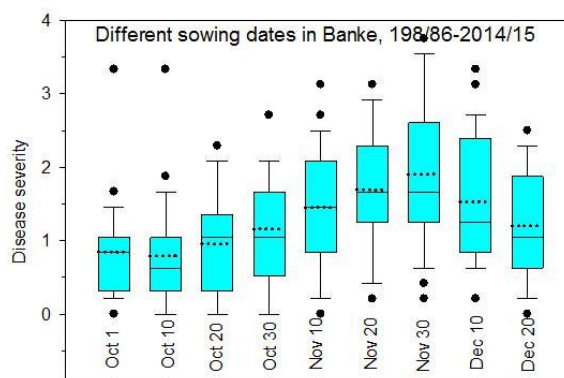
Lentil is a prioritized value chain for Feed the Future in Nepal. However, the intensification possibilities for this crop have proven difficult to identify because lentil is highly susceptible to drought, excess soil moisture and disease – especially *Stemphylium*, a fungal disease that can cause total crop failure in high rainfall years. Survey data suggests that more than 60% of lentil-growing farmers in the FtF Zone incur financial losses from lentil cultivation in such years.

Can better genetics reduce risks to lentil cultivation?

Since 2015 CSISA has been collaborating with the National Grain Legume Research Program (NGLRP), and ICARDA to evaluate 100 lentil genotypes from the Mediterranean region for broad-adaptability to drought and excess moisture conditions. Among the genotypes tested in 2015–16, five lines were observed to be resilient to drought in a year without winter rainfall. Out of those five lines, three lines performed well in the ‘normal’ rainfall conditions observed in 2016–17 and the jury is still out with respect to performance in a wet year. On-farm evaluations are underway with seed companies to move these lines towards registration and commercialization.

Agro-climatology for lentil advisory

CSISA conducted a simulation study using historical climate data (1985 – 2014) to drive the Stempedia model in order to **anticipate the recurrence frequency and severity of *Stemphylium* blight**. Adaptive measures such as **planting date and varietal choice were also evaluated**. Results suggest that more than 73% of all years are expected to have high disease severity resulting in significant productivity losses. Results also suggest that disease severity increases with delayed crop establishment and, consequently, the risks posed by *Stemphylium* blight can be greatly reduced through timely planting.



TEMPORAL VARIATION IN *STEMPHYLIUM* DISEASE SEVERITY AS A FUNCTION OF PLANTING DATES. VALUES > 1 IMPLY SIGNIFICANT YIELD LOSSES. T

Building coalitions for lentil intensification

CSISA collaborated with the National Grain Legume Research Program and the Department of Agriculture (DoA) to organize a consultation meeting on *Stemphylium* disease management strategies in lentil, covering the status of disease incidence and severity, empirical findings on management techniques and associated deployment strategies to reach farmers at scale.

In collaboration with NGLRP and DoA, CSISA developed guidelines for *Stemphylium* disease management and has disseminated it through District Agriculture Development Offices (DADOs), seed companies, the USAID-funded KISAN project, and co-operatives so that farmers can act before the disease emerges. Similarly, CSISA developed a radio jingle on *Stemphylium* management and aired it through local radio FM stations in local languages before the lentil flowering season, which is the critical stage for the disease appearance. As 2017 was a favorable year for lentil production (no heavy winter rainfall) and disease incidence was low, we could not quantify the value of these extension approaches. Additional evaluations are planned for the forthcoming lentil season.

CSISA is also forging a new alliance with USAID-funded Climate Services for Resilient Development project. This collaboration will emphasize the use of weather forecast information to improve disease management in lentil.

Mungbean

Expanding mungbean cultivation through market facilitation

As a short-duration crop that can be cultivated during the hot 'summer' period before the arrival of monsoon rains, mungbean can be cultivated without displacing existing crops while generating significant economic, nutritional and soil health benefits. To raise awareness and stimulate new commercially-oriented production, CSISA convened 20 community-level meetings and two regional-level meetings that united millers and the extension system with farmers in areas where new output market opportunities for mungbean are strong. Community radio has also been mobilized for social marketing purposes, with mungbean information broadcast on the Ujyalo radio network through 75 stations in the FtF Zone.

This effort to facilitate mungbean production helped to increase its production significantly. **In 2017, more than 1,500 farmers were newly engaged with mungbean grain production and in aggregate produced more than 600 tons of grains with a market value of US\$ 540,000.** This reflects significant growth from the previous year when 600 farmers produced around 85 tons of grain. Prior to CSISA's efforts, this low risk and high return pulse crop was not cultivated at scale in the FtF Zone of Nepal.

Several producer groups and market actors across the value chain are now coming forward to take advantage of new commercial opportunities. For example, GATE Nepal and Panchasakti Seed Company have added mungbean seed to their core product lines. At the end of March, they had stocked 8 tons of seed at retailers across Kailali and Kachanpur Districts, three times more than the seed stocks held at the same time in 2016.

In aggregate, CSISA's market survey **found that approximately 15 tons of mungbean seed was sold in the FtF Zone in 2017, 50% higher than in 2016.** The volume is expected to reach more than 20 tons in 2018.

The public sector is also constructively responding, with several District Agriculture Development Officers including mungbean in their 'pocket' programs and supported farmers to procure seed (on a 50 to 100% subsidy) and thorough technical trainings, with CSISA coordinating on the latter. In 2017, DADOs from 10 Terai districts facilitated mungbean production on 50 ha, covering about 500 households. As a result of increased demand, the National Grain Legume Research Program increased the breeder and foundation seed production of mungbean varieties by twofold, as compared to 2014.

**मुसुरोवालीमा लाग्ने
डढुवा रोगको व्यवस्थापन**

डढुवा रोग के हो ?

यो मुसुरोवा लाग्ने एक प्रकारको डुलीजन्य रोग हो । यो रोगलाई स्टेमफिलियम डढुवा पनि भनिन्छ । यो रोग ब्राल: कुल भुल्ने बेलामा देखिन्छ र रोगको प्रयोग बढी भएमा पुरै बाती नोस्नहुन हुन पनि सक्छ ।

यो रोग कस्तो अवस्थामा देखा पर्छ ?

यो रोग खास गरी भुसुरो भुल्ने बेलामा आसन्नमा बढेर लागेला, पानी परेमा वा लामो समयसम्म हुन्नु लागेला देखा पर्दछ ।

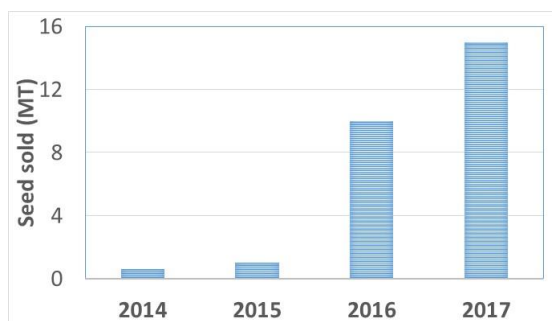
यो रोग कसरी सर्दछ ?

यो रोग बीउ र रोग लागेला बातीका डुटाहरुमा बसेका निचामुको च्यागबाट सर्दछ । रोग लागेको बीउ खरीवाट हावाको माध्यमबाट उडेका रोगका निचामुले रोग नालेको बीउमा पनि यो रोग सर्छ ।

रोगको रक्षण के हो ?

रोगको प्रयोगबाट निम्न किसिमका रक्षणहरु देखा पर्दछन् :

GUIDELINES FOR STEMPHYLIUM MANAGEMENT IN LENTIL



MUNGBEAN SEED SOLD IN FEED THE FUTURE DISTRICTS

OBJECTIVE 3: SUSTAINABLE WHEAT INTENSIFICATION AT SCALE

Wheat is the third most important crop staple in Nepal, following rice and maize in terms of importance. In the Terai, where production is concentrated, wheat productivity is threatened by shorter winters and terminal heat stress during grain filling – a worsening scenario with progressive climate change. In the mid-hills, wheat is vulnerable to damaging drought conditions if planted after the last monsoon rains. To assist farmers to better cope with rising temperatures and variable rainfall patterns, CSISA collaborates with the Nepal Agricultural Research Council to conduct applied research into how agronomic practices can build resilience. In turn, CSISA aligns with government, civil society, and private sector partners to take these insights to scale.

Wheat crop cut and production practice survey

To capture changes in management practices and to estimate benefits of technology adoption, a ‘crop cut and production practices’ survey was conducted in April 2017, after wheat harvest. The survey was intended, in part, to capture changes in management practices associated with CSISA interventions, including our social marketing campaigns such as radio jingling on the importance of early wheat sowing, increasing irrigation when winter rains are absent, and gains in yield potential that can be achieved by planting longer duration varieties. The survey will also inform our scaling strategy for 2017–18, while providing landscape intelligence for other projects and government initiatives going forward.

For the survey, we used remote sensing data to develop a representative sampling scheme that captures gradients in wheat productivity levels at the regional scale. The survey was developed in Open Data Kit (ODK) and deployed via smart phones.

Partnering with Nepal government to guide new investments

The Government of Nepal recently endorsed a new twenty-year agriculture development strategy that charts a progressive course of action to revitalize agriculture as an engine for economic growth and domestic food security. At the center of this strategy is the Prime Minister’s Agriculture Modernization Project. The project will be implemented over the next decade and has research and development mandates for productivity enhancement and commercialization of major cereals, fisheries, fruits and vegetables.



PMAMP emphasizes wheat production in the western Terai region as a food security priority, and endeavors to achieve national self-sufficiency in wheat within the next three years. Meeting this extremely ambitious goal will require an unprecedented increase in average yields of 10% per year, and necessitates a high level of strategic coordination among organizations contributing to agricultural development in Nepal. PMAMP has recognized CSISA as a technical advisor and strategic partner to design and implement programs for staple crop production, including mechanization and seed systems.

In coordination with the PMAMP, the first national ‘wheat forum’ was organized on July 26–27, 2017 in Kathmandu to begin to coordinate efforts of the 21 key public and private stakeholders working on extension, research and agriculture sector development. To frame the discussion, CSISA scientists presented a synthesis of findings from our production practice surveys to give all stakeholders a clear view of prevailing on-farm realities and geographically disaggregated entry points for

innovation. Discussion at the forum then emphasized the identification of proven best practices for sustainable intensification, consideration of scaling pathways for knowledge and technological innovations, knowledge gaps and areas for future research and joint work plan development for the 2017–18 wheat season. Going forward, **CSISA sees the PMAMP as a key mechanism for scaling up sustainable intensification technologies in Nepal.**

Energized by this successful wheat thematic working group meeting, the PMAMP took the lead to organize a similar meeting for maize and is working on organizing a forum for rice.

Social marketing through established and emerging communications channels

Varietal replacement: The seed replacement rate for wheat is very low (>12%) and farmers still use obsolete varieties that are susceptible to diseases and have low yield potential. To raise awareness about the importance of varietal replacement and adjustment of planting time for existing improved varieties, CSISA collaborated with the National Wheat Research Program, District Agriculture Development Offices, and seed companies to produce and broadcast radio jingles through local and national stations. Data collected from companies selling new wheat varieties **indicate that over 3,000 farmers would adopt the new varieties in four Feed the Future districts.**

Importance of irrigation and fertilizer management in

wheat: More than 80% of farmers in the Mid and Far West irrigate their wheat only once, even if winter rains are scarce and irrigation is available (CSISA survey result, 2015). Many farmers are unaware of the yield benefits of providing a second irrigation to wheat. To build knowledge about the importance of irrigating wheat in dry winters, CSISA collaborated with the District Agriculture Development Offices in four districts to produce radio jingles in local languages. Focused group discussions conducted in five districts after wheat seeding shows that 7% of the wheat-growing farmers heard the jingle, and among those who heard it, 50% applied additional irrigation, a result that demonstrates the power of using radio to disseminate agro-advisories. **In FY17, we estimate that 5,000 farmers across four Feed the Future districts in the Terai applied additional irrigation on nearly 3,000 ha.**

१. जातको छनोट
गहुँको जात छनोट गर्दा सो क्षेत्रको लागि सिफारिस गरिएको सबैभन्दा सुहाउँदो र बढी उत्पादन दिने जात नै छान्नु पर्दछ।

बोपाखो तराई र नारायणी क्षेत्रका लागि सिफारिस गरिएका गहुँका जातहरू			बोपाखो तराई			नारायणी		
जात	पाके दिन	उत्पादन (टन/हिक्)	जात	पाके दिन	उत्पादन (टन/हिक्)			
गोता	१११	२.२४	ढोके	११५	३.३			
भुसुटी	१२०	३.३३	डब्लु के १२०४	१४०	२.२६			
सिन्धु	११६	२.१४	घोलापिरी	११६	२.२३			
अदिस	११८	३.११	अनमुरा-३	११५	३.६६			
एन एच १४१	१२२	३.०२	अनमुरा-४	११५	३.३३			

AGRONOMY TIPS FOR WHEAT

Collaborations with development partners: With the National Wheat Research Program, CSISA updated factsheets for better wheat agronomy for wheat from seeding to harvesting to storage based on research outcomes from different areas. **Three thousand factsheets were deployed prior to the start of the 2016–17 wheat season** through public and private partners such as District Agriculture Development offices, Improved Seed for Farmers project (KUBK), KISAN, and NIMBUS. For the coming wheat season, the government-implemented PMAMP project (i.e. wheat ‘super zone’) is printing and deploying the wheat tips and planning to disseminate them through their own networks.

From the CSISA’s household survey data it can be estimated that **the agronomy ‘tips’ have facilitated 5,300 farmers to adopt early wheat establishment on 3,700 ha in the 2016–17 wheat season.**

Building a service economy for zero tillage wheat

Zero tillage can facilitate timely sowing while also reducing crop establishment costs, but is a completely new technology in the FtF Zone. In collaboration with The Habi, a seed drill trader, CSISA

started demonstrating zero tillage (ZT) during the 2014–15 wheat season. Also, in collaboration with The Habi, CSISA provided technical training for service providers on how to calibrate and operate ZT seed drills. **With assistance from CSISA, more than 150 service providers have purchased seed drills and established ZT wheat on more than 400 ha during the 2016–17 wheat season.**

In collaboration with private sector machinery suppliers, District Agriculture Development Offices and seed companies, CSISA has facilitated demand generation for ZT through strategically placed demonstrations, training events, and participation in agricultural fairs. CSISA has also aired radio jingles on local FM radio stations about the benefits of ZT along with contact information for service providers. At the dealer level, CSISA has placed additional ZT drills in machinery showrooms on a consignment basis so that market availability increases in areas in the Feed the Future Zone where machinery retail networks are comparatively weak. CSISA also facilitated the establishment of two machinery custom hiring centers in Bardiya, which are providing different machinery-based services, including ZT wheat, on a custom-hire basis.



ZERO TILLAGE WHEAT ESTABLISHMENT

Seeing the benefits of ZT wheat, as well as rising demand from farmers, most of the District Agriculture Development offices and the PMAMP wheat super zone program have included ZT wheat technology into their own programs. **CSISA has played a market facilitation role by linking machinery importers with local traders so that machine supply as well as spare parts availability is assured.**

OBJECTIVE 4: PRECISION NUTRIENT MANAGEMENT AT SCALE

In Nepal, fertilizer use is far below the state recommendation for all staple crops. Also, current fertilizer use recommendations are outdated and applied across very broad areas of the country with few guidelines in place to improve the efficiency of use (e.g., nutrient balance, timing, placement, formulation). Further, existing recommendations were developed on experiment stations under conditions that have very little to do with the realities of on-farm production and the variation that exists at nested scales from the village, to landscape, to region.

Evidence from the central hills of Nepal demonstrates the power of ‘getting it right’, with net returns from maize increasing by approximately US\$ 400/ha with sensible investments in fertilizer. Three factors play a dominant role in determining how much fertilizer is required to optimize crop growth and economic yield: attainable yield potential at the farm level, indigenous soil fertility, and the efficiency of use of applied nutrients.

Domain- and-situation specific soil fertility management strategies developed for wheat, lentil and maize

A household survey conducted for rice and wheat in the Feed the Future zone showed under-fertilization and imbalanced application are major reasons for low crop productivity in Nepal. On average, farmers apply nitrogen and phosphorus fertilizer at rates less than 50% of the national recommendations. Only 13% of farmers apply potassium. One of reasons that farmers do not follow recommendations is that confidence in them is generally low. Recommendations are applied across broad areas of the country without considering soil and management influences on economically optimum application rates or farmer preferences for investment in soil enhancement. To characterize fertilizer responses with respect to seeding time, variety and irrigation levels across major soil gradients, CSISA is combined on-farm and on-station research in coordination with the USAID-Nepal funded NSAF (Nepal Seed and Fertilizer, US\$ 15 m from 2016–2021) project, an initiative with a focus that spans the applied science-to-development continuum, inclusive of market facilitation efforts to expand private sector-led fertilizer sales. **NSAF was designed by CSISA staff during 2016 to capitalize on the evidence, insights, and momentum created by CSISA programming in Nepal and is intended to catalyze the adoption of precision nutrient management practices by more than 50,000 households.** This is a prime example of the leverage created by CSISA through other programming and is fully aligned with USAID-Nepal’s priorities for the Feed the Future zone.

Broad-scale awareness of the yield and economic benefits of judicious fertilizer application

In coordination with NSAF, research findings have been communicated to the local level through trainings (DADO-recruited village technicians, co-operative members, local fertilizer suppliers, DADOs; wheat super zone technicians and operational committee members, seed company technicians); deployment of the simple agronomic tips through public and private partners such as DADOs, super zones, KISAN, private seed companies, Seed for Farmers Project (KUBK); and radio jingles. Communicating the importance of fertilizer management through co-operatives is the most effective pathway as they also supply fertilizer to farmers in their command areas. CSISA has developed posters about the importance of fertilizer and placed them in the co-operatives. Partially because of CSISA’s efforts, technicians and farmers are well sensitized about importance of balanced fertilizer application. This is reflected in increased demand for DAP and potassium fertilizer, as well as the rising number of co-operatives stocking it, although they used to only sell urea fertilizer. Through these initiatives, **1,047 households applied potassium at sufficient rates for wheat for the first time in the 2016–17 wheat season.**

Also, farmers have started to split the fertilizer application instead of applying a single dose, as the split application of urea fertilizer increases the fertilizer use efficiency. During the reporting period, from the household survey and focus group discussion it is estimated that **4,238 farmers have applied better management practices (balance fertilizer with split application) in this reporting period.**

Policy-level initiatives

As a result of collaborative research conducted with CSISA, the National Wheat Research Program suggested that the current recommended fertilizer rate for wheat (100:50:25 kg NPK/ha) be updated to 150:50:50 kg NPK/ha. They also committed to reflecting additional factors of production (e.g., variety and time of establishment) into further revisions of the official recommendations for wheat. New recommendations will be scaled through the Department of Agriculture.

Accessible technologies identified and commercialized for increasing the efficiency of fertilizer use

Low-cost spreaders efficiently bring precision management to smallholders

The hand broadcasting of seed and fertilizer is common in Nepal and results in patchy distribution and inefficient uptake of nutrients by plants, leading to a significant reduction in crop yields compared to those achievable under better management. To minimize the variability associated with hand broadcasting, CSISA introduced mechanical seed and fertilizer spreaders into its working domains in Nepal in 2014. Mechanical spreaders can be used for broadcasting seed such as rice, wheat, lentil, mungbean, and granular fertilizer such as Urea and DAP. Research shows that the use of a **precision spreader improves yields by 7–10% and generates 50% savings in labor costs and time involved for fertilizer application.** Khushiram Chaudhary, a farmer in Dang district, commented that, “This machine is very easy to handle for the uniform broadcasting of urea, and about three times faster than hand broadcasting.”



KHUSHIRAM CHAUDHARY USING A PRECISION SPREADER

In Nepal, farmer adoption of new agricultural technologies can be very slow. To facilitate the adoption of spreaders, CSISA has worked with manufacturers, importers, local distributors, District Agriculture Development Offices, farmers' cooperatives, USAID-funded project such as KISAN and Nepal Seed and Fertilizer project and seed companies to evaluate and facilitate the testing and uptake of these compact tools. For example, in response to feedback from farmers about the strengths and weaknesses of different designs, CSISA worked closely with manufacturers improve build-quality and user-friendliness. As a result, one low-cost manufacturer added a calibration scale to the unit to facilitate uniform spreading and improved the durability of the stitching of the nylon.

CSISA also provided training to cooperatives, extension personnel and agrovet technicians to help facilitate the uptake of spreaders across a wide geography. Over three years, **CSISA trained more than 200 service providers, over 1,000 key farmers, and more than 200 agricultural technicians from both the public and private sectors.** In 2015, CSISA produced a user-friendly guide for the precision spreader, covering handling guidelines for both seed and fertilizer broadcasting. Between

2015 and 2017, 3,000 of these guides were distributed to farmers' co-operatives, agrovets, other USAID-funded projects, District Agriculture Development Offices, and the government-led Prime Minister's Agriculture Modernization Project, all of which are interested in supporting the deployment of precision spreaders.

Given the high level of farmer acceptance and the identification of a low-cost regional manufacturer, three major importers – SK Traders, AMC and BTL Traders – have started importing and selling precision spreaders through more than 20 dealers across the country. **To date, more than 1,500 units have been imported and sold commercially and traders have placed order for > 500 units. If used for spreading rice seed, this quantity of spreaders has the potential to cover more than 3,000 ha in a season.** In 2017, many of the District Agriculture Development Offices in the Terai have included precision spreaders in their machinery subsidy programs, allowing farmers to procure the equipment at reduced from local suppliers.

CSISA has been collecting feedback on machine performance from the key deployment partners. Most of the DADOs reported that the spreader is effective for broadcasting seed and fertilizer and they will consider organizing awareness campaigns in their domains before the 2017–18 wheat season. Agrovet personnel shared that many farmers have shown interest in the spreaders, but have also asked about after-sales service and the availability of the spare parts, an issue to be addressed by the importers. A service provider, Purna Bahadur Sahi, reported that the machine is more comfortable than manual broadcasting, it saves time and minimizes drudgery. He noted that the uniformity and efficiency are the same at the start and end of the broadcasting process. In manual broadcasting, however, efficiency decreases with time as the operator tires.

CSISA is optimistic about market-led expansion precision spreading technology in Nepal due to the initial support that the technology enjoys across the value chain. The increasing number of importers and dealers selling the spreaders at the local level signals that the private sector sees value in the technology and expects a robust market to emerge. DADOs embedding precision spreaders into their subsidy schemes reflects local public-sector responsiveness to farmer demand, and farmers procuring the technology shows that farmers believe the technology will be remunerative, despite the initial investment cost. The sustainable intensification of cereal systems in Nepal will, indeed, depend on farmers adopting affordable, scale-appropriate technologies such as precision spreaders to generate higher yields from small landholdings in the face of labor constraints common in Nepal's agricultural areas.

Key challenges faced during the reporting period

- Weather:
 - In some areas, excessive rainfall occurred during wheat harvesting season. As a result, seed companies could not procure wheat seed as expected due to high moisture levels since none of the companies has a drying facility.
 - Mungbean suffered a serious drought during its production period (March–May), which has resulted in poorer yields than expected.
- Evolving process of political devolution: Nepal remains in the midst of a complicated effort of building a federated structure with more regional autonomy. Local elections have been held in many of Nepal's new federal provinces, one result being that the agricultural budget that used to be with the District Agriculture Development Offices has been diverted to new, local administrative units. As there is no clear-cut breakdown of local budget by sector, many agricultural development support programs have been deferred or otherwise delayed.

Engagement with Missions, FTF partners and project sub-contractors

USAID Missions

CSISA engaged with the Nepal mission in the following core areas in FY17:

- Provided technical advice and support to the KISAN project (USAID-Nepal's flagship FTF program) on staple crop management.
- Shared technical insights into challenges and opportunities confronting the sustainable intensification of staple crop systems in Nepal that (we believe) have informed the development of the forthcoming KISAN II project solicitation.
- Led the formulation of the new 'Nepal Seed and Fertilizer' (NSAF) project funded by USAID-Nepal (US\$ 15 m, 2016–2021) and deeply collaborated on issues of complementary interest, including precision nutrient management and business mentoring for seed companies.
- Suggested the formation of the 'M&E Working Group of Agriculture Partners,' which was subsequently convened by USAID Nepal. CSISA participates in group meetings and provides feedback on various M&E and FTFMS Indicator issues. CSISA also presented a technical session on 'incremental sales analysis' during the working group meeting on Feb 23, 2017.
- Aided the USAID Integrating Gender and Nutrition within Agricultural Extension Services project in investigating the gendered impacts of scale-appropriate mechanization in the mid-hills.

FTF partners

In Nepal, the KISAN project, part of USAID's global Feed the Future initiative, is a \$20 m five-year program working to advance food security objectives by increasing agricultural productivity. KISAN works collaboratively with CSISA by utilizing technical and extension materials and advice to improve the uptake of better-bet sustainable agriculture production and post-harvest practices and technologies for targeted cereals. KISAN has a reach of hundreds of thousands of farmers, who have been exposed to CSISA information, materials, and technologies through this partnership.

During the reporting period, CSISA and KISAN have:

- Produced accessible guides for **better bet agronomy for rice and maize** – information that is generally not available to smallholders. KISAN has reproduced these guides with their own resources and they provide the backbone of their technical training programs for maize and rice, the two core staple crop value chains for the project. In 2016, 60,205 **farmers received the rice tips and 69,923 farmers have received the maize tips in the 20 FtF districts** through the KISAN network.
- Developed a factsheet on *Stemphylium* management for lentil and provided training to technicians from DADOs, KISAN, seed companies and some key farmers in different districts with the objective to disseminate the information to additional farmers

Appendix 1 – Staffing

Name	Role	Institution	Address	Phone (+977)	Email
Andrew McDonald	Project Leader	CIMMYT	Kathmandu, Nepal	9808757832	a.mcdonald@cgiar.org
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Scott Justice	Obj 5 Theme Leader	CIMMYT	Kathmandu, Nepal	9851027678	s.justice@cgiar.org
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Appendix 2 – Project subcontractors and key partners

NEPAL				
PARTNER	PARTNERSHIP OBJECTIVE	ALIGNMENT WITH THEMES	LEVERAGING OPPORTUNITY	STATUS OF PARTNERSHIP
Government of Nepal				
Ministry of Agricultural Development	Technical guidance for GoN investments in agricultural development	All	New Agriculture Development Strategy approved by GoN in Fall of 2015. CSISA acts as a technical partner to shape the loan and investment programs associated with ADS, which may exceed \$100 m USD.	Active and sanctioned by CIMMYT's host country agreement
Nepal Agricultural Research Council (NARC)	Strategic and applied research on SI technologies	Innovation towards impact	NARC is responsible for providing the science basis of all state recommendations; their endorsement and ownership of emerging sustainable intensification technologies is essential.	Active and long-standing
Department of Agriculture (DoA)	Front line extension and support to farmers, service providers, and private sector	Achieving impact at scale	DoA has staff at the district level across Nepal and considerable budgets to support programming; CSISA assist in improving the quality of extension messaging and works to deepen linkages to private sector.	Active and long-standing
Nepali private sector				
Machinery importers (BTL, SK Traders, Dhahal, etc.)	Introduction and market development for scale-appropriate machinery	Achieving impact at scale	Rapid expansion of investment in scale-appropriate machinery and support for emerging service provision markets.	Active and long-standing
NIMBUS	Introduction and market development for new crop varieties and hybrids	Achieving impact at scale	Registration and market development for hybrids in the Feed the Future zone from a base of zero in 2015.	Active since 2015
NGO				
NAMEA	Trade association formed with the help of CIMMYT to	Systemic change	Important voice for private sector with GoN as the Agriculture Development Strategy support programs	Active since 2014

	create an enabling environment and policy dialogue for scale-appropriate mechanization in Nepal	towards impact	take shape.	
SEAN	Trade association strengthened with the help of CSISA to create an enabling environment and policy dialogue for seed system strengthening / SMEs in Nepal	Systemic change towards impact	Important voice for private sector with GoN as the ADS support programs take shape.	Active and long-standing
Universities				
University of Illinois	Strategic research and landscape diagnostics to uncover patterns of spatial variability in crop performance and the contributing factors for yields gaps in Nepal cereal crops	Innovation towards impact	Collaboration with advanced research institution increases the quality of science conducted in Nepal; national partners learn new research methods and contribute to the formulation of new research questions.	Active
University of Nebraska	Opportunities for agronomic practices to conserve water, reduce risk, and enhance yields in maize-based systems in the hills of Nepal	Innovation towards impact	Collaboration with advanced research institution increases the quality of science conducted in Nepal; national partners learn new research methods and contribute to the formulation of new research questions.	Active
Wageningen University	Role of livestock and value chains in farmer willingness to invest in maize	Innovation towards impact	Collaboration with advanced research institution increases the quality of science conducted in Nepal; national partners learn new research methods and contribute to the formulation of new research	Active

	intensification		questions.	
Projects				
Knowledge-based Integrated Sustainable Agriculture and Nutrition (KISAN)	Strategic partnership to co-support on the large scale deployment of extension information and technologies	Achieving impact at scale	The KISAN project, part of USAID's global Feed the Future (FTF) initiative, is a US\$ 20 million five-year program working to advance food security objectives by increasing agricultural productivity. KISAN works collaboratively with CSISA by utilizing technical and extension materials, and advice, to Improve the uptake of better-bet sustainable agriculture production and post-harvest practices and technologies for targeted cereals. KISAN has a reach of hundreds of thousands of farmers, who have been exposed to CSISA information, materials, and technologies through this partnership.	Active for 3+ years
Nepal Seed and Fertilizer Project (NSAF) -USAID	Strategic partnership to co-support on the large scale deployment of extension information and technologies	Achieving impact at scale	USAID-Nepal funded NSAF (Nepal Seed and Fertilizer, \$15 m from 2016–2021) project, an initiative with a focus that spans the applied science-to-development continuum, inclusive of market facilitation efforts to expand private sector-led fertilizer sales. CSISA is taking advantage to disseminate the better-bet technology at scale through the NSAF networking	New
Building Resilience and Adaptation to Climate Extremes and Disaster (BRACED)- DFID	Opportunistic partnership to take advantage of value chains, entrepreneurial skills and collections centers created by BRACED partners	Achieving impact at scale	DFID-UK funded BRACED project prioritizes 'Developing Climate Resilient Livelihoods for local communities through public-private partnership for 500,000 poor people in western Nepal that suffer from climate extremes and disasters'. CSISA is taking advantage to disseminate the better-bet technology, farm mechanization at scale through the BRACED networking	Active for 2+ years
Seed For Farmer Project (KUBK) - IFAD	Opportunistic partnership to take advantage of their	Achieving impact at	IFAD-funded Government led seed project with the objective to Support Extension of the Formal Seed	New

	net-working for the dissemination of appropriate farm mechanization and best bet technologies	scale	Sector and Entrepreneurship and Institutional Development. CSISA is taking advantage to disseminate the better-bet technology, strengthening seed systems at scale through their networking	
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Appendix 3: CSISA-Nepal Scaling and the GFSA

Global Food Security Act Goal: Sustainably reduce global hunger, malnutrition, and poverty

GFSA Objective 1

Inclusive and sustainable agricultural-led economic growth

Seed systems: Input dealers stock registered **maize hybrids**

Seed systems: Private seed companies expand businesses for **wheat and pulses**

Seed systems: Strategic investments & **enhanced coordination** among seed system actors

Pulses: New **low-risk opportunity crops** promoted by government and private sector, along with economic and nutritional messaging

Wheat: **Domain-specific recommendations** for management practices that will enable early wheat establishment

Wheat: **Social marketing** approaches utilized to 'get the word out' on better-bet agronomy for wheat

Precision Nutrient Management: Domain- and situation-specific **soil fertility management strategies** developed for wheat, lentil and maize

Precision Nutrient Management: **Broad-scale awareness** of the yield and economic benefits of judicious fertilizer application

Mechanization and Irrigation: Appropriate technologies for overcoming energy and cost bottlenecks to **irrigation expansion** identified

Mechanization and Irrigation: Identification of physical and operational models of **land aggregation** to permit inclusive access to innovative mechanization technologies

Mechanization and Irrigation: **New business opportunities** for laser land leveling, zero tillage, & mechanized harvesting defined with expected returns for all value chain actors

Mechanization and Irrigation: **Advancing attachment design** and commercial availability for the two-wheel tractor and mini-tiller platforms

Mechanization and Irrigation: **Market development** for importers and manufacturers of agricultural machinery

← Cereal Systems Initiative for South Asia (CSISA) in Nepal, Agronomy and Seed Systems Scaling Interventions →

GFS Objective 2

Strengthened resilience among people and systems

Pulses: Production targeting and innovative agronomy to enhance yields and reduce risk of lentil failure

Pulses: New low-risk opportunity crops promoted by government and private sector, along with economic and nutritional messaging

Wheat: Domain-specific recommendations for management practices that will enable early wheat establishment

Precision Nutrient Management: Accessible technologies identified and commercialized for increasing the efficiency of fertilizer use

Mechanization and Irrigation: Appropriate technologies for overcoming energy and cost bottlenecks to **irrigation expansion** identified

Mechanization and Irrigation: Advancing attachment design and commercial availability for the two-wheel tractor and mini-tiller platforms

Mechanization and Irrigation: Improving capacity for machinery evaluation and design improvement among NARES partners

Mechanization and Irrigation: Strengthened training facilities and programs for rural and urban-based agro-machinery repair

Mechanization and Irrigation: Market development for importers and manufacturers of agricultural machinery

Pulses: New low-risk opportunity crops promoted by government and private sector, along with economic and nutritional messaging

Seed systems: Input dealers stock registered maize hybrids

↖ Cereal Systems Initiative for South Asia (CSISA) in Nepal, Agronomy and Seed Systems Scaling Interventions ↗

GFS Objective 3

A well-nourished population,
Esp. women and children

CSISA-Nepal activities also map against the following Intermediate Results:

- **IR 1:** Strengthened inclusive agriculture systems that are productive and profitable
- **IR 2:** Strengthened and expanded access to markets and trade
- **IR 3:** Increased employment and entrepreneurship
- **IR 4:** Increased sustainable productivity, particularly through climate-smart approaches
- **IR 7:** Increased consumption of nutritious and safe diets

As well as these Cross-Cutting Intermediate Results:

- **CC IR 3:** Increased gender equality and female empowerment
- **CC IR 4:** Increased youth empowerment and livelihoods

Appendix 4. Indicator Numbers Covering October 2016 through September 2017

Indicator / Disaggregation	2017		2017	2017	2017
	Target	Actual	Deviation	Comment	Deviation Narrative
EG.3.2-1: (4.5.2-7) Number of individuals who have received USG-supported short-term agricultural sector productivity or food security training (RAA) (WOG)	500	535	7%	This number counts individual received short-term training (1 to 3 days) in various better-bet agronomic practices. NOTE: Due to likely loss of funding, the project was instructed to set 2018 targets to zero.	
Type of Individual	500	535	7%		
Producers	310	320	3%		
Male		229			<i>Note that in 2016 when USAID's indicator system was revised, the FTFMS shifted all of our targets to "disaggregates not available" automatically. To understand our deviation, please look at the cumulative numbers.</i>
Female		91			
Disaggregates Not Available	310				
People in government	100	119	19%	This number counts training participants representing government organizations including District Agricultural Development Officers and staff of government Agriculture Service Centers.	Government partner involvement has increased in CSISA activities. For example, our partnership with the Prime Minister's Agriculture Modernization Program of the Ministry of Agri. Development has increased public-sector participation in various types of trainings organized by CSISA.
Male		94			<i>Note that in 2016 when USAID's indicator system was revised, the FTFMS shifted all of our targets to "disaggregates not available" automatically. To understand our deviation, please look at the cumulative numbers.</i>
Female		25			
Disaggregates Not Available	100				
People in private sector firms	50	52	4%	This number counts training participants representing private seed companies, agri inputs suppliers (agrovets), cooperatives and seed companies.	
Male		43			<i>Note that in 2016 when USAID's indicator system was revised, the FTFMS shifted all of our targets to "disaggregates not available" automatically. To understand our deviation, please look at the cumulative numbers.</i>
Female		9			
Disaggregates Not Available	50				
People in civil society	40	44	10%	This number counts training participants representing local level non-government organizations and community-based	

				organizations.	
Male		36			Note that in 2016 when USAID's indicator system was revised, the FTFMS shifted all of our targets to "disaggregates not available" automatically. To understand our deviation, please look at the cumulative numbers.
Female		8			
Disaggregates Not Available	40				
Disaggregates Not Available					
Male					
Female					
Disaggregates Not Available					

Indicator / Disaggregation	2017		2017	2017	2017
	Target	Actual	Deviation	Comment	Deviation Narrative
EG.3.2-4: (4.5.2-11) Number of for-profit private enterprises, producers organizations, water users associations, women's groups, trade and business associations, and community based organizations (CBOs) receiving USG food security related organizational development assistance (RAA) (WOG)	410	434	6%	This indicator counts the number of private enterprises such as inputs suppliers, producers, business associations, seed companies, cooperatives, community based organizations have received support on their organizational development like business mentoring. NOTE: Due to likely loss of funding, the project was instructed to set 2018 targets to zero.	
Type of organization	410	434	6%		
For-profit private enterprises	200	206	3%	This number counts the number of private enterprises such as agricultural inputs suppliers (agrovets), business associations, seed companies, cooperatives, community based organizations that received assistance.	
Producers organizations	135	146	8%		
Water users associations					
Women's groups	50	55	10%		
Trade and business associations	25	27	8%	This number captures the trade organizations those are involved mainly in trading of cereal crops improved and hybrid seeds and other agricultural inputs and received organizational development assistance.	
Community-based organizations (CBOs)					
Disaggregates Not Available					
New/Continuing	410	434	6%		
New	135	166	23%		CSISA provided business development support to a large number of private organizations, including and especially seed companies and input suppliers.
Continuing	275	268	-3%		
Disaggregates Not Available					

Indicator / Disaggregation	2017		2017	2017	2017
	Target	Actual	Deviation	Comment	Deviation Narrative
EG.3.2-17: (4.5.2-5) Number of farmers and others who have applied improved technologies or management practices with USG assistance (RAA) (WOG)	30,400	32,267	6%	This indicator counts farmers who have applied improved agricultural technologies such as the cultivation of new crop varieties, adoption of various cultural practices, soil fertility activities, supplemental irrigation, water management and postharvest activities. NOTE: Due to likely loss of funding, the project was instructed to set 2018 targets to zero.	
Producers	30,400	32,267	6%		
Sex	30,400	32,267	6%		
Male	21,280	22,047	4%		
Female	9,120	10,220	12%		The large number of women-headed farming households in Nepal has driven our overachievement in this category.
Disaggregates Not Available					
Technology type	30,400	32,722	8%		
crop genetics	15,000	16,223	8%	This number counts farmer who have cultivated improved crop varieties of maize, wheat, lentil and mungbean.	
cultural practices	5,700	6,217	9%	This number counts farmers adopting various cultural practices activities such as drill use, weed management, crop intensification, relay cropping.	
livestock management					
wild fishing technique/gear					
aquaculture management					
pest management					
disease management					
soil-related fertility and conservation	4,000	4,238	6%	This number counts farmers adopting soil fertility management activities such as use of spreader, and fertilizer management activities.	
irrigation	1,400	1,500	7%	This number captures farmer adopted irrigation management practices specifically supplement irrigation for wheat and maize (winter & spring)	
water management (non-irrigation)	2,800	2,973	6%	This number captures farmer adopted laser land leveler and seeding time of wheat and maize (winter & spring)	

climate mitigation					
climate adaptation					
marketing and distribution					
post-harvest - handling and storage	1,500	1,571	5%	This number captures farmer used reaper to harvest wheat.	
value-added processing					
other					
Disaggregates Not Available					
Commodity		32,722			
Maize		4,719			
Wheat		18,998			
Lentil		3,910			
Mungbean		5,095			

Indicator / Disaggregation	2017		2017	2017	2017
	Target	Actual	Deviation	Comment	Deviation Narrative
EG.3.2-18: (4.5.2-2) Number of hectares of land under improved technologies or management practices with USG assistance (RAA) (WOG)	12,800	14,367	12%	This indicator counts area (ha) under improved agricultural technologies such as adoption of new crop varieties, and improved cultural practices. NOTE: Due to likely loss of funding, the project was instructed to set 2018 targets to zero.	The main drivers of our success for this indicator include the adoption of seed drills for zero tillage, precision spreaders, and the timely irrigation for wheat.
Technology type	12,800	14,367	12%		
crop genetics	7,500	8,021	7%	This number counts area (ha) under new and improved crop varieties of maize, wheat, lentil and mungbean.	
cultural practices	2,200	2,525	15%	This number counts area (ha) under various cultural practices activities such as drill use, weed management, crop intensification and relay cropping.	Increased adoption of zero tillage using seed drills as well as the application of integrated weed management practices were the main driving forces behind our success in this category.
pest management					
disease management					
soil-related fertility and conservation	1,000	1,135	13%	This number counts area (ha) under soil fertility management activities such as use of spreader, and fertilizer management aspects.	The overachievement in this category was driven strongly by the increased uptake of the precision spreader, especially in wheat.
irrigation	700	784	12%	This number captures area (ha) under irrigation management practices specifically supplement irrigation for wheat and maize (winter & spring)	CSISA campaigns on the benefits of timely irrigation increased our success in this area, as more farmers applied supplemental irrigation in wheat and maize.
water management (non-irrigation)	1,400	1,489	6%	This number captures area (ha) under laser land leveler and seeding time of wheat and maize (winter & spring)	
climate mitigation					
climate adaptation					
other (Post harvest)		413		This number counts the area (ha) covered by farmers practicing postharvest handling and improved crop storage.	The category of post-harvest appears in the indicator for the # of farmers, but not in the # of hectares, so this achievement has been categorized under "other."
Disaggregates Not Available					

Sex	12,800	14,367	12%		
Male	7,680	8,383	9%		
Female	1,920	2,286	19%		The large number of women-headed farming households in Nepal has driven our overachievement in this category.
Joint	2,560	2,918	14%		Many households in Nepal are considered to be jointly headed, given the important role that women play in agricultural work in Nepal even when the man has not migrated outside of the area for work.
Association-applied	640	780	22%		CSISA saw an increasing number of farmers' groups and associations adopting sustainable intensification technologies, providing technologies or services for members and others.
Disaggregates Not Available					
Commodity		14,367			
Maize grain		2,143			
Wheat		9,538			
Lentil		983			
Mungbean		1,703			

Indicator / Disaggregation	2017		2017	2017	2017
	Target	Actual	Deviation	Comment	Deviation Narrative
EG.5.2-1: Number of firms receiving USG-funded technical assistance for improving business performance (O)	710	770	8%	This indicator counts the agricultural firms have received technical assistance to improve their business performance activities. NOTE: Due to likely loss of funding, the project was instructed to set 2018 targets to zero.	N/A
Type of Firm	710	770	8%		
Formal	10	61	510%		This achievement was achieved through technical performance provided to formal firms such as seed companies and agro-vets.
Informal	700	709	1%		
Disaggregates Not Available					
Duration	710	770	8%		
New	710	737	4%		
Continuing		33			CSISA has continued providing technical support to 33 firms since last year.
Disaggregates Not Available					